Code Number: **A**

Aakash

Medical | IIT-JEE | Foundations

Corp. Office: Aakash Educational Services Limited, 3rd Floor, Incuspaze Campus- 2, Plot No. 13, Sector- 18, Udyog Vihar, Gurugram, Haryana - 122015

Time: 3 hrs. **Max. Marks: 70**

Mock Test Paper for Class-XII

BIOLOGY

Roll No. | | | | | | | | | | | |

GENERAL INSTRUCTIONS

Read the following instructions carefully and follow them :

(i) This question paper contains **33** questions. **All** questions are **compulsory**.

(ii) This question paper is divided into **five** sections – **Sections A, B, C, D and E.**

(iii) In **Section A,** Question nos. **1** to **12** are **Multiple Choice type questions (MCQs)** and Question nos. **13** and **16** are **Assertion-Reason based** questions of **1 mark each**.

(iv) In **Section B,** Question nos. **17** to **21** are **Very Short Answer type** questions, carrying **2 marks each**.

(v) In **Section C,** Question nos. **22** to **28** are **Short Answer type** questions, carrying **3 marks each**.

(vi) In **Section D,** Question nos. **29** to **30** are **Case study-based questions,** carrying **4 marks each.**

(vii) In **Section E,** Question nos. **31** to **33** are **Long Answer type** questions, carrying **5 marks each**.

(viii) There is no overall choice. However, internal choices have been provided in some questions A student has to attempt only one of the alternatives in such questions.

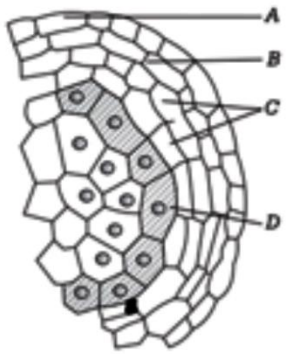
(ix) Use of calculators are **not** allowed.

(x) Wherever necessary, neat and properly labelled diagrams should be drawn.

SECTION-A

Q. No. 1 to 12 are multiple choice questions. Only one of the choices is correct. Select and write the correct choice as well as the answer to these questions.

1. The given figure is the enlarged view of microsporangium showing wall layers A, B, C and D.



Which of the following layer(s) of anther perform the function of protection and help in the dehiscence of anther?

(a) B and C only
(b) Only D
(c) Only A
(d) A, B and C

2. The total number of chromosomes in human spermatid and secondary spermatocyte are

(a) 46 and 46 respectively
(b) 23 and 46 respectively
(c) 23 and 23 respectively
(d) 46 and 23 respectively

3. Among the following which one is the most widely accepted method of contraception in India and has less failure rates in comparison to other mentioned contraceptive methods?

(a) IUD
(b) Cervical caps
(c) Coitus interruptus
(d) Diaphragms

4. A monohybrid cross was carried out between two tall plants with both having a genotype Tt. What percentage of the progeny among the tall individuals would be heterozygous for the character?

(a) 75%
(b) 25%
(c) 50%
(d) 66.66%

5. The number of base pairs in a given stretch of DNA were analysed to be three in number. The two strands of DNA are paired through hydrogen bonds. Upon analysis, six H-bonds were found at the given stretch. Which among the following nitrogenous bases cannot be present in the given stretch?

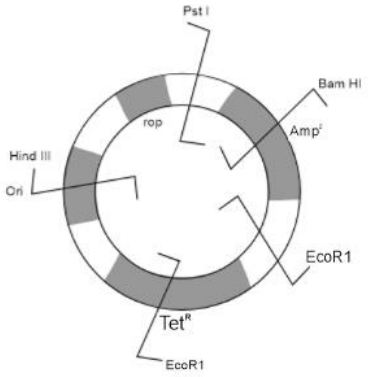
I. Guanine
II. Thymine
III. Adenine
IV. Cytosine

(a) II and III
(b) I and IV
(c) Only III
(d) Only IV

6. The most accepted line of descent in human evolution is
   (a) *Australopithecus* → *Ramapithecus* → *Homo sapiens* → *Homo habilis*
   (b) *Homo erectus* → *Homo habilis* → *Homo sapiens*
   (c) *Ramapithecus* → *Homo habilis* → *Homo erectus* → *Homo sapiens*
   (d) *Australopithecus* → *Ramapithecus* → *Homo erectus* → *Homo habilis* → *Homo sapiens*
7. Immunity developed through vaccination illustrates
   (a) Artificially acquired passive immunity
   (b) Naturally acquired passive immunity
   (c) Artificially acquired active immunity
   (d) Naturally acquired active immunity
8. Which one of the following are an example of commensalism?
   I. An orchid growing as an epiphyte on a mango branch
   II. Superior barnacle *Balanus* dominates the intertidal area, and excludes the smaller barnacle *Chathamalus* from that zone
   III. Sea anemone has stinging tentacles and the clown fish lives among them
   IV. Barnacles growing on the back of a whale
   (a) Only I and III
   (b) Only III and IV
   (c) I, II and III
   (d) I, III and IV
9. Match the following organisms with the **correct** product obtained from them

Microorganism	**Product**
(a) *Clostridium butylicum*	(i) Statins
(b) *Aspergillus niger*	(ii) Cyclosporin A
(c) *Trichoderma polysporum*	(iii) Citric acid
(d) *Monascus purpureus*	(iv) Butyric acid

   (a) (a)-(iv) , (b)- (iii), (c)- (i), (d)- (ii)
   (b) (a)-(iv) , (b)- (iii), (c)- (ii), (d)- (i)
   (c) (a)-(iii) , (b)- (iv), (c)- (i), (d)- (ii)
   (d) (a)-(iv) , (b)- (ii), (c)- (iii), (d)- (i)
10. Given below is the map of a cloning vector (plasmid). On the basis of the diagram which restriction enzyme is best suited if we want the recombinant transformants to be ampicillin resistant?



   (a) *EcoRI*
   (b) *BamHI*
   (c) *HindIII*
   (d) *PstI*

11. The patient suffering from ADA deficiency requires periodic infusion of genetically engineered lymphocytes as these cells are not immortal and dies after specific duration. Which one of the following strategies can provide a permanent cure?

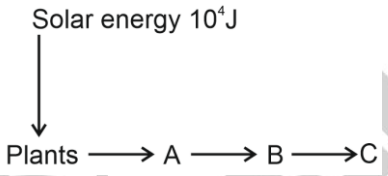
    (a) Engineering lymphocytes by switching ON their oncogenes so that they can proliferate indefinitely.

    (b) Providing enzyme replacement therapy

    (c) Bone marrow transplantation

    (d) Introducing ADA gene isolated from marrow cells into cells at an early embryonic stages

12. Consider the following food chain, if only 1% of incident solar radiation is captured by the plants for photosynthesis, what is the amount of biomass present at trophic level B (in units of energy)?



    (a) 100 J (b) 10 J

    (c) 1 J (d) 0.1 J

Questions numbers 13 to 16 are Assertion (A) and Reason (R) type questions. Two statements are given – one labelled as Assertion (A) and the other labelled as Reason (R). Select the **correct** answer from the codes (a), (b), (c) and (d) as given below.

(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).

(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).

(c) Assertion (A) is true, but Reason (R) is false.

(d) Assertion (A) is false but Reason (R) is true.

13. **Assertion:** When two pairs of traits are combined in a hybrid, segregation of one pair of characters is always independent of the other pair of characters.

    Reason: Complete independent assortment of genes is possible only when they are present on different chromosomes.

14. **Assertion:** BOD is a measure of the organic matter present in the water.

    Reason: BOD test measures the rate of uptake of oxygen by micro-organisms in a sample of water.

15. **Assertion:** DNA molecules are forced to move from anode to cathode in gel electrophoresis by applying the electric field.

    Reason: DNA molecules are negatively charged molecules.

16. **Assertion:** Predators in nature are 'prudent'.

    Reason: Prey species have evolved various defenses to lessen the impact of predation.

SECTION-B

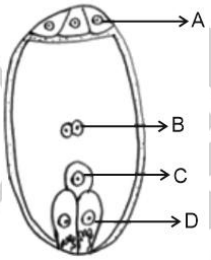
This section contains 5 questions with internal choice in Two question. The following questions are very short answer type and carry 2 marks each.

17. During the mid of the menstrual cycle, there is a surge in the levels of a gonadotropin named 'X' which causes the rupture of Graafian follicle and the release of ovum.
    (a) Name the gonadotropin 'X' responsible for this rupture of Graafian follicle. Which gland is responsible for secreting 'X'?
    (b) Name the secretory structure formed from the remaining parts of the ruptured Graafian follicle and the hormone secreted by it.

OR

    (a) Name the hormone 'Y' which acts on the Leydig cells present in the testes and stimulate them to produce androgens. Which gland secretes the hormone 'Y'?
    (b) How is spermiation different from spermiogenesis?

18. Given below is a diagram representing a mature embryo sac of a dicot plant.



    (a) Identify "D" and state its role during the fertilization.
    (b) Describe the fate of "B" once it undergoes fusion with the male gamete.

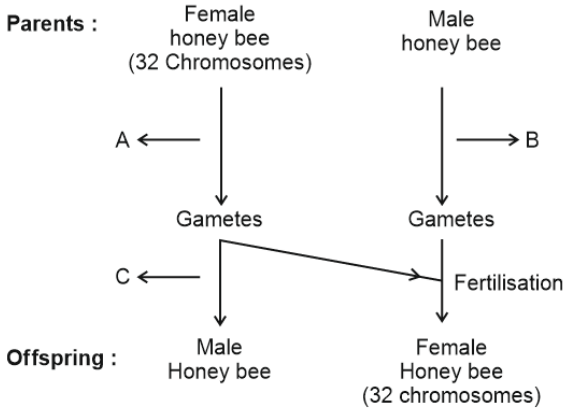
OR

"In majority of aquatic plants, pollination is carried out by insects or wind rather than water". Justify the statement by giving an example. Also provide an example of an aquatic plant where pollination happens by water itself.

19. The excessive use of the chemical fertilisers to meet the ever-increasing demand of agricultural produce has contributed significantly to soil and water pollution. How can a switch to organic farming and use of biofertilizers can help with this challenge? Give two examples of biofertilizers to support your answer.

20. (a) Pyramids of number, energy and biomass are upright in an ecosystem. Are there any exceptions to the pyramid of number? Justify
    (b) Draw an ecological pyramid of biomass for aquatic ecosystem.

21. Given below is the cross between male and female bee. Answer the following questions:



(a) What is the number of chromosomes in male honey bees? What kind of sex determination is this called?

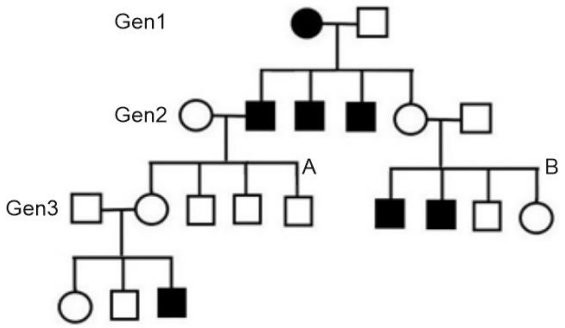
(b) Name the process "C" by which the development of males take place in honey bees.

OR

Write down any four important features of *Drosophila melanogaster* which makes it a suitable material for genetic studies.

SECTION-C

22. On the basis of following pedigree chart, answer the questions that are given below:



(i) Is the pedigree showing sex linked recessive inheritance or an autosomal recessive inheritance pattern?

(ii) Give an example of a genetic disease which shows similar inheritance pattern.

(iii) What is the genotype of a daughter in generation 3 in family B? Draw a cross using suitable symbols to arrive at your answer.

23. (a) Distinguish between parthenocarpy and apomixis.

(b) Production of hybrid seeds is an expensive process. How does the development of apomictic seeds reduce the burden on farmers?

(c) How multiple embryos are formed in citrus fruits?

24. (a) What role does male accessory glands play in reproduction?

(b) The human male ejaculates about 200 to 300 million sperms during a coitus of which, for normal fertility, at least 60 per cent sperms must have normal shape and size and at least 40 per cent of them must show vigorous motility. A couple fails to conceive after repeated attempt. It was found that the issue was related to low sperm count and reduced motility of the sperms. Which ART would you suggest to the couple to have the baby?

(c) A couple wishes to adopt only natural method for contraception. Which time window they should avoid during coitus to prevent pregnancy?

25. (a) Breast-feeding during the initial period of infant growth is recommended by doctors for bringing up a healthy baby. Give two reasons.

(b) The widespread use of contraceptive methods has a significant role in checking uncontrolled growth of population. However, they have possible ill-effects. Provide any two such ill-effects associated with hormonal pills.

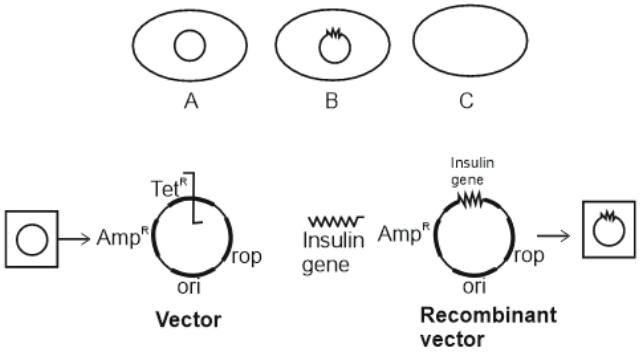
26. (a) In what ways do thorns and spines exhibit convergent evolution in plants despite their distinct evolutionary paths?

(b) "Evolution is not a directed process in the sense of determinism". Comment.

27. (a) Which type of cells are responsible for secreting antibodies? Name the type of immunity associated with antibodies.

    (b) List various therapeutic approaches available for cancer (any four).

28. Given below is the figure representing three different types of bacterial hosts A, B and C after the transformation. A plamid vector can be seen in some of the bacterial hosts.



    (i) Which one of the above type host is desirable for further process of recombinant DNA technology?

    (ii) How the selection of desired host will be carried out?

    (iii) How can type 'C' be eliminated by the process of antibiotic selection?

SECTION-D

29. Read the following and answer the given questions:

    Harold Taylor performed an experiment involving *Vicia faba* (broad bean) root tips, which are rich in rapidly dividing cells, perfect for studying DNA replication.

    Taylor's method involved incorporating a radioactive isotope of thymidine (tritium-labelled thymidine) into the DNA of these cells. Thymidine is a nucleoside that is only incorporated into newly synthesized DNA strands during DNA replication. The experiment proceeded as follows:

- Labelling Phase: The root tips were grown in a medium containing radioactive thymidine, allowing the radioactive label to be incorporated into the DNA during replication.
- Growth Phase: After a period of labelling, the root tips were transferred to a non-radioactive medium, allowing further cell divisions to occur without new radioactive thymidine.
- Observation Phase: The cells were then prepared for microscopic examination. The chromosomes were stained and autoradiography technique was used to detect the radioactive thymidine.

    Autoradiography involves placing the stained cells on photographic film, where the radiation from the thymidine would expose the film, creating a visual record of the labelled DNA. This allowed the researchers to see which strands of DNA had incorporated the radioactive label.

    (a) What do you think this experiment was aimed for?

    (b) Name the researchers who carried out the similar experiment for the same objective.

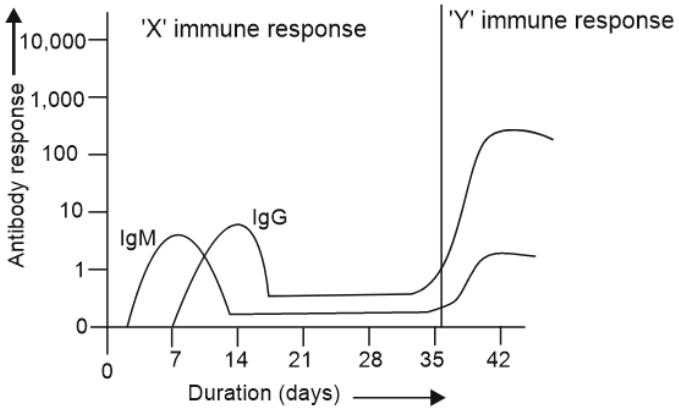
    Attempt either subpart c or d

    (c) How are the observational approaches differ in the two similar experiments carried?

    OR

    (d) State two other features of DNA replication.

30. Study the following graph and answer the questions that follow:



(a) Identify 'X' and 'Y' and differentiate between them.

(b) Which type of antibody is transferred across the placenta from the mother to foetus?

Attempt either subpart c or d

(c) Illustrate the structure of an antibody molecule.

OR

(d) This 'X' and 'Y' immune response are parts of acquired immunity. Differentiate between acquired and innate immunity.

SECTION-E

The following questions are long answer types and carry 5 marks each. All questions have an internal choice.

31. Given below is the DNA sequence of coding strand of DNA Molecule

5' ATGGCTAGTTAA 3'

(i) Predict the mRNA sequence for the above.

(ii) What is the maximum number of amino acids present in the polypeptide coded by the given sequence?

(iii) What are the 5' and 3' modifications carried out during mRNA processing in eukaryotes?

(iv) Which amino acid is coded by the first codon of the above sequence?

(v) Francis Crick proposed that there has to be a mechanism to read the code and also to link it to the amino acids. Name the molecule later identified, which carries out this function.

OR

(i) What properties of DNA make it more suitable than RNA as the genetic material in organisms? Suggest three reasons-

(ii) Given below is the sequence of template strand of DNA molecule:

3'- TACGCCTCTGCATCG -5'

How would the length of the polypeptide would be affected if T at seventh position is replaced by A?

32. (a) Which essential components are required for a PCR reaction and what roles do they play?

(b) What are the applications of PCR in medical diagnostics and forensics?

OR

(a) What is the principle behind PCR, and what are the key steps involved in the process?

(b) If you start a PCR reaction with 10 DNA molecules and run it for 5 cycles, how many copies of the DNA molecules will you have at the end of the process?

33. (a) What is the reason behind the greater biological diversity at tropics? Give three reasons.

(b) List the "Evil Quartet" responsible for loss of biodiversity.

OR

(a) Describe three major reasons to conserve biodiversity.

(b) What are the conditions necessary for region to be declared biodiversity hotspot?

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